



integration with integrity

3308350 User's Manual

PCI-ISA Bus SBC

Version 1.0

- CompactFlash • Mini PCI-E Slot • 8-bit I/O •
- DVI-I/CRT/LVDS • Dual GB LAN • Audio •
- SATA • ATA/33/66/100 • RS-232/422/485 •
- USB2.0 • WDT • H/W Monitor •



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Safety Instructions

Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:

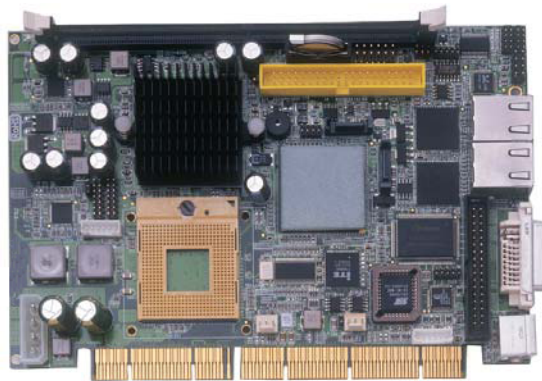
- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This helps to discharge any static electricity on your body.
- Wear a wrist-grounding strap, available from most electronic component stores, when handling boards and components. Fasten the ALLIGATOR clip of the strap to the end of the shielded wire lead from a grounded object. Please wear and connect the strap before handle the product to ensure harmlessly discharge any static electricity through the strap.
- Please use an anti-static pad when putting down any components or parts or tools outside the computer. You may also use an anti-static bag instead of the pad. Please inquire from your local supplier for additional assistance in finding the necessary anti-static gadgets.

NOTE: *DO NOT TOUCH THE BOARD OR ANY OTHER SENSITIVE COMPONENTS WITHOUT ALL NECESSARY ANTI-STATIC PROTECTIONS.*



Chapter 1

General Description



The 3308350 is an Intel® 945GME GMCH chipset-based board designed. The 3308350 is an ideal all-in-one PCI-ISA Bus single board computer. Additional features include an enhanced I/O with CF, DVI-I/CRT/LVDS, dual GB LAN, audio, SATA, COM, and USB2.0 interfaces.

Designed with the Intel® 945GME GMCH, the board supports Intel® Core™ 2 Duo/Core™ Duo/Core™ Solo processor 1.66~2.33GHz.

Its onboard ATA/33/66/100 to IDE drive interface architecture allows the 3308350 to support data transfers of 33, 66 or 100MB/sec. to one IDE drive connection. The Intel® ICH7-M serial ATA controller with two ports supporting transfer rates up to 150MB/sec.

Onboard Intel® 945GME GMCH for CRT display with DVMT or CHRONTEL 7307 for DVI-I display supporting up to 2048 x 1536. It also supports 18-bit single channel/36-bit dual channel LVDS interface.

System memory is also sufficient with the one DDRII socket that can support up to 2GB.

Additional onboard connectors include an advanced USB2.0 port providing faster data transmission. And two external RJ-45 connectors for 10/100/1000 Based Ethernet uses.

To ensure the reliability in an unmanned or standalone system, the watchdog timer (WDT) onboard 3308350 is designed with software that does not need the arithmetical functions of a real-time clock chip. If any program causes unexpected halts to the system, the onboard WDT will automatically reset the CPU or generate an interrupt to resolve such condition.

1.1 Major Features

The 3308350 comes with the following features:

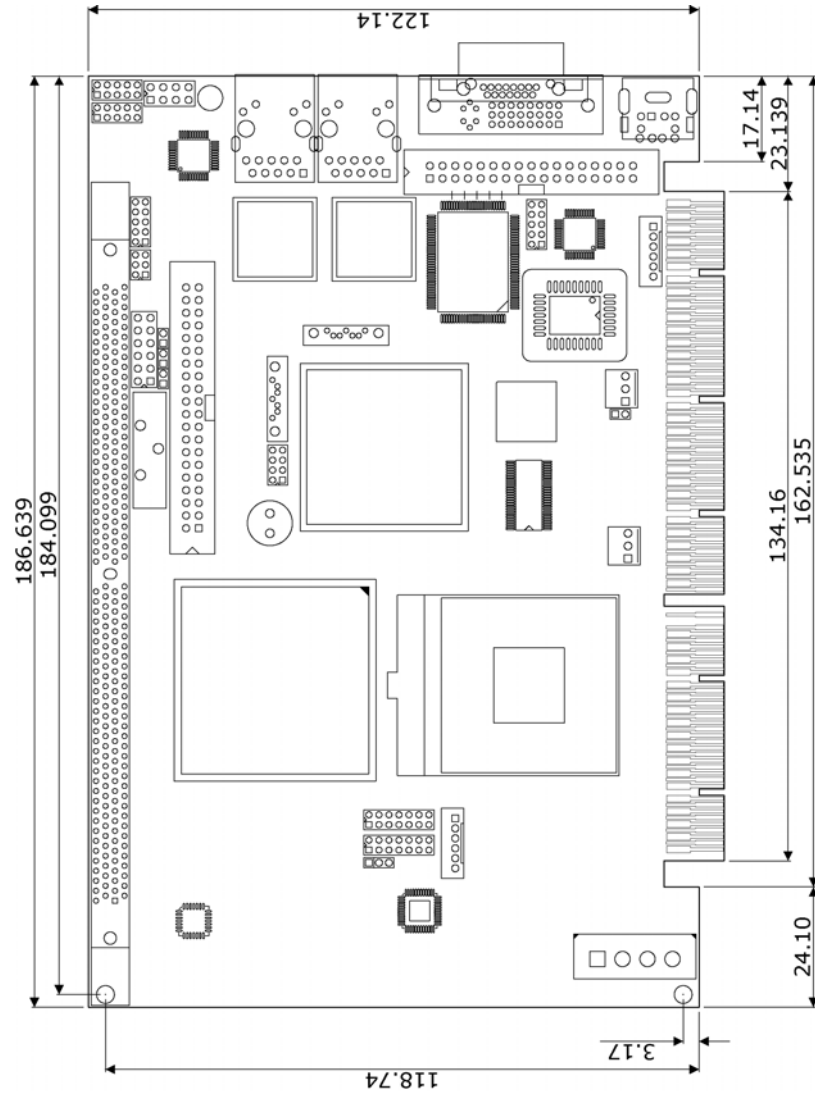
- Intel® Core™ 2 Duo/Core™ Duo/Core™ Solo processor 1.66~2.33GHz
- Supports 667/533MHz FSB
- One DDRII socket with a max. capacity of 2GB
- Intel® 945GME GMCH/ICH7-M chipset
- Winbond W83627EHG super I/O chipset
- Intel® 945GME or CHRONTEL 7307 DVI-I graphics controller
- 18-bit/36-bit LVDS panel display interface
- Dual Intel® 82573L Gigabit Ethernet controller
- AC97 3D audio controller
- Intel® ICH7-M Serial ATA controller
- Fast PCI ATA/33/66/100 IDE controller
- CF, mini PCI-E slot x 1, 8-bit I/O, 2 COM, 3 USB2.0
- Hardware Monitor function

1.2 Specifications

- **CPU:** Intel® Core™ 2 Duo/Core™ Duo/Core™ Solo processor
1.66~2.33GHz
Celeron® M: 410, 420, 430, 440, 450
Core™ Duo: T2300, T2400, T2500, T2600, T2700
Core™ 2 Duo: T5500, T5600, T7200, t7400, T7600
- **Bus Interface:** PCI-ISA Bus (no 3.3V output through glodfinger)
- **Front Side Bus:** 667/533MHz FSB
- **Memory:** One DDRII socket supports up to 1GB
- **Chipset:** Intel® 945GME GMCH/ICH7-M
- **I/O Chipset:** Winbond W83627EHG
- **CompactFlash:** One, Type I/II IDE interface adapter
- **PCI Slot:** One, mini PCI-E slot
- **8-bit I/O:** 8-bit input/output (parallel port)
- **VGA:** Intel® 945GME for CRT display with DVMT or CHRONTEL 7307 for DVI-I display, supports up to 2048 x 1536 (DVI-I and CRT connector is optional)
- **LVDS Panel:** Supports 18-bit single channel/36-bit dual channel LVDS interface

-
- **Ethernet:** Dual Intel® 82573L 10/100/1000 Based LAN
 - **Audio:** AC97 3D audio controller
 - **Serial ATA:** Intel® ICH7-M controller and with 2 ports
 - **IDE:** One 2.54-pitch 40-pin IDE connector
 - **FDD:** Supports up to two floppy disk drives
 - **Serial Port:** 16C550 UART-compatible RS-232/485 x 1 and RS-232 x 1 serial ports with 16-byte FIFO
 - **USB:** 3 USB2.0 ports, internal x 2 and external x 1 (external is optional)
 - **Keyboard/Mouse:** PS/2 6-pin Mini DIN or 6-pin connector
 - **BIOS:** AMI PnP Flash BIOS
 - **Watchdog Timer:** Software programmable time-out intervals from 1~255 sec.
 - **CMOS:** Battery backup
 - **Hardware Monitor:** Winbond W83627EHG
 - **Board Size:** 18.6(L) x 12.2(W) cm

1.3 Board Dimensions



Chapter 2

Unpacking

2.1 Opening the Delivery Package

The 3308350 is packed in an anti-static bag. The board has components that are easily damaged by static electricity. Do not remove the anti-static wrapping until proper precautions have been taken. Safety Instructions in front of this manual describe anti-static precautions and procedures.

2.2 Inspection

After unpacking the board, place it on a raised surface and carefully inspect the board for any damage that might have occurred during shipment. Ground the board and exercise extreme care to prevent damage to the board from static electricity.

Integrated circuits will sometimes come out of their sockets during shipment. Examine all integrated circuits, particularly the BIOS, processor, memory modules, ROM-Disk, and keyboard controller chip to ensure that they are firmly seated. The 3308350 delivery package contains the following items:

- **3308350 Board x 1**
- **Utility CD Disk x 1**
- **Cables Package x 1**
- **Jumper Bag x 1**
- **User's Manual**



Cables Package	
NO.	Description
1	IDE flat cable x 1
2	Floppy flat cable x 1
3	COM flat cable x 2
4	SATA power cable x 1
5	SATA cable x 1
6	Audio cable x 1
7	Two USB flat cable with bracket x 1

It is recommended that you keep all the parts of the delivery package intact and store them in a safe/dry place for any unforeseen event requiring the return shipment of the product. In case you discover any missing and/or damaged items from the list of items, please contact your dealer immediately.

Chapter 3

Hardware Installation

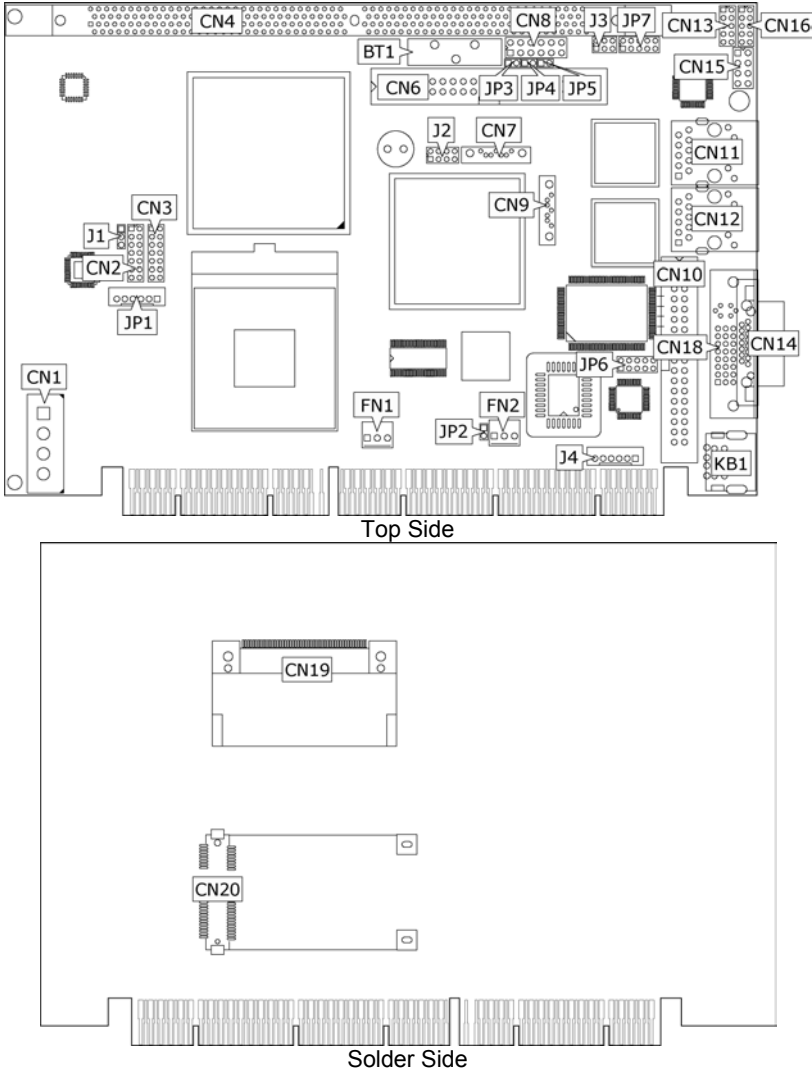
This chapter provides the information on how to install the hardware using the 3308350. This chapter also contains information related to jumper settings of switch, and watchdog timer selection etc.

3.1 Before Installation

After confirming your package contents, you are now ready to install your hardware. The following are important reminders and steps to take before you begin with your installation process.

1. Make sure that all jumper settings match their default settings and CMOS setup correctly. Refer to the sections on this chapter for the default settings of each jumper. (Set JP3 open)
2. Go through the connections of all external devices and make sure that they are installed properly and configured correctly within the CMOS setup. Refer to the sections on this chapter for the detailed information on the connectors.
3. Keep the manual and diskette in good condition for future reference and use.

3.2 Board Layout



3.3 Jumper List

Jumper	Default Setting	Setting	Page
JP2	FSB Frequency Select: <i>667MHz FSB</i>	Open	10
JP3	Clear CMOS: <i>Normal Operation</i>	Open	18
JP4	CF Use Master/Slave Select: <i>Slave</i>	Open	23
JP5	AT/ATX Function Select: <i>ATX</i>	Open	18
JP7	COM 2 Use RS-232 or RS-422/485 Select: <i>RS-232</i>	Open	15
J1	Panel Voltage Select: <i>+3.3V</i>	Short 2-3	10

3.4 Connector List

Connector	Definition	Page
CN1	4-pin Power In Connector	18
CN2/CN3	LVDS Panel Connector	10
CN4	DDRII Socket	10
CN6	IDE Connector	13
CN7/CN9	Serial ATA Connector	14
CN8	System Front Panel Control	20
CN10	Floppy Connector	15
CN11/CN12	RJ-45 Connector	17
CN13/CN16	COM 1/COM 2 Connector (5x2 header)	15
CN14/J2	USB2.0 Port	17
CN15	MIC In/Line Out Connector	22
CN17	15-pin CRT Connector	10
CN18	DVI-I Connector	10
CN19	CompactFlash Connector	23
CN20	Mini PCI-E Slot	24
JP1	Inverter Power In Connector	10
JP6	8-bit I/O Port	24
J3	RS-422/485 Connector	15
J4	6-pin KB/MS Connector	19
FN1/FN2	Fan Power In Connector	18
KB1	PS/2 6-pin Mini DIN KB/MS Connector	19

3.5 Configuring the CPU

The 3308350 provides with Intel® Core™ 2 Duo/Core™ Duo/Core™ Solo processor 1.66~2.33GHz.

- **JP2: FSB Frequency Select**

Options	Settings
533MHz FSB	Short
667MHz FSB (default)	Open



3.6 System Memory

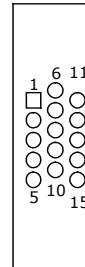
The 3308350 provides one DDRII socket at locations CN4. The maximum capacity of the onboard memory is 2GB.

3.7 VGA Controller

The 3308350 provides three connection methods of a VGA device. CN17 offers a single standard CRT connector and CN2/CN3 are the LVDS interface connectors onboard reserved for flat panel installation. And 3308350 also provides DVI-I connector at CN18.

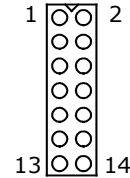
- **CN17: CRT Connector**

PIN	Description	PIN	Description
1	Red	2	Green
3	Blue	4	N/C
5	GND	6	GND
7	GND	8	GND
9	N/C	10	GND
11	N/C	12	SDA
13	HSYNC	14	VSYNC
15	SDL		



● **CN2/CN3: LVDS Interface Connector**

PIN	Description	PIN	Description
1	V _{LCD}	2	V _{LCD}
3	GND	4	GND
5	Y0-/Z0-	6	Y0+/Z0+
7	Y1-/Z1-	8	Y1+/Z1+
9	Y2-/Z2-	10	Y2+/Z2+
11	CLK-	12	CLK+
13	N/C	14	N/C



NOTE: LVDS cable should be produced very carefully. Y0- & Y0+ have to be fabricated in twister pair (Y1- & Y1+, Y2- & Y2+ and so on) otherwise the signal won't be stable. Please set the proper voltage of your panel using J2 before proceeding on installing it.

NOTE: If use CN2 only, it just supports 18-bit single channel LVDS panel; If you want to use 36-bit dual channel LVDS panel, please use CN2 and CN3 combined.

The 3308350 has an onboard jumper that selects the working voltage of the flat panel connected to the system. Jumper J1 offers two voltage settings for the user.

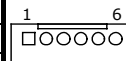
● **J1: Panel Voltage Select**

Options	Settings
+5V	Short 1-2
+3.3V (default)	Short 2-3



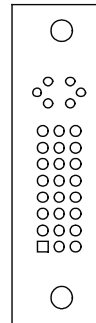
● **JP1: Inverter Power In Connector**

PIN	Description
1	+12V
2	+12V
3	+5V
4	+5V
5	VDDEN
6	GND



● **CN18: DVI-I Connector**

PIN	Description	PIN	Description
1	- DATA2	2	DATA2
3	GND	4	-DATA4
5	DATA4	6	DDCCLK
7	DDCDATA	8	VSYNC
9	-DATA1	10	DATA1
11	GND	12	-DATA3
13	DATA3	14	VCC5
15	GND	16	HPDET
17	-DATA0	18	DATA0
19	GND	20	-DATA5
21	DATA5	22	GND
23	CLK	24	-CLK
25	RED	26	GREEN
27	BLUE	28	HSYNC
29	GND	30	GND

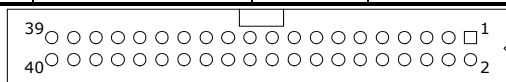


3.8 PCI E-IDE Drive Connector

CN6 is a standard 2.54-pitch 40-pin connector daisy-chain driver connector serves the PCI E-IDE drive provisions onboard the 3308350. A maximum of two ATA/33/66/100 IDE drives can be connected to the 3308350 via CN6.

- **CN6: IDE Connector**

PIN	Description	PIN	Description
1	IDERST	2	GND
3	PDD7	4	PDD8
5	PDD6	6	PDD9
7	PDD5	8	PDD10
9	PDD4	10	PDD11
11	PDD3	12	PDD12
13	PDD2	14	PDD13
15	PDD1	16	PDD14
17	PDD0	18	PDD15
19	GND	20	N/C
21	PDDREQ	22	GND
23	IOW#	24	GND
25	IOR#	26	GND
27	PIORDY	28	470Ω with GND
29	PDDACK#	30	GND
31	IRQ14	32	N/C
33	PDA1	34	PD33/66
35	PDA0	36	PDA2
37	PDCS1#	38	PDCS3#
39	HDD Active	40	GND

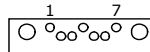


3.9 Serial ATA Connector

You can connect the Serial ATA device that provides you high speeds transfer rates (150MB/sec.). If you wish to use RAID function, please note that these two serial ATA connectors just support RAID0 and only compatible with WIN XP.

- **CN7/CN9: Serial ATA Connector**

PIN	Description
1	GND
2	SATATXP
3	SATATXN
4	GND
5	SATARXN
6	SATARXP
7	GND

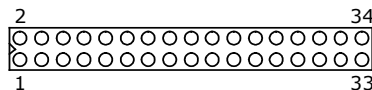


3.10 Floppy Disk Drive Connector

The 3308350 uses a standard 34-pin header connector, *CN10*, for floppy disk drive connection. A total of two FDD drives may be connected to *CN10* at any given time.

- **CN10: Floppy Connector**

PIN	Description	PIN	Description
1	GND	2	DRVDEN0
3	GND	4	N/C
5	GND	6	DRVDEN1
7	GND	8	INDEX#
9	GND	10	MTR0#
11	GND	12	DS1#
13	GND	14	DS0#
15	GND	16	MTR1#
17	GND	18	DIR#
19	GND	20	STEP#
21	GND	22	WDATA#
23	GND	24	WGATE#
25	GND	26	TRAK00#
27	GND	28	WRTPRT#
29	GND	30	RDATA#
31	GND	32	HDSEL#
33	GND	34	DSKCHG#



3.11 Serial Port Connectors

The 3308350 offers NS16C550 compatible UARTs with Read/Receive 16-byte FIFO serial ports and five internal 10-pin headers and two RS-485 connectors.

- **CN13/CN16: COM 1/COM 2 Connector (5x2 Header)**

PIN	Description	PIN	Description
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND	10	N/C



- **J3: RS-485 Connector (3x2 Header)**

PIN	Description	PIN	Description
1	TX-	2	TX+
3	RX+	4	RX-
5	GND	6	VCC



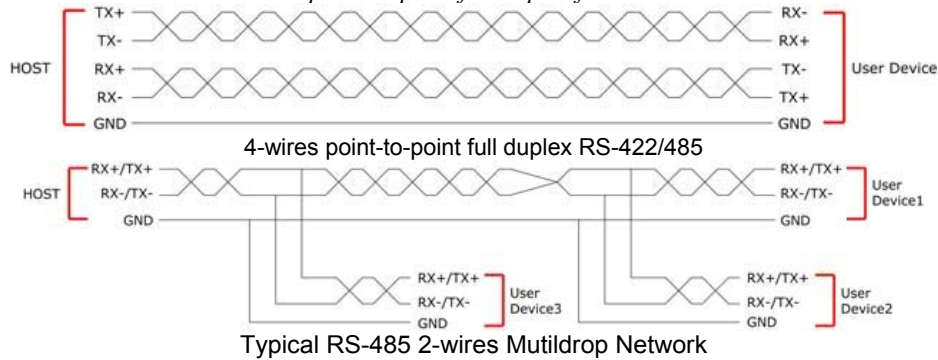
- **JP7: COM 2 use RS-232 or RS-485 Select**

Options	Settings
RS-232 (default)	Open
RS-485 by Auto (*1)	Short 1-2, 3-4, 5-7, 8-10
RS-485 by -RTS (*1)	Short 1-2, 3-4, 7-9, 8-10
RS-485 Full Duplex (*2)	Short 1-2, 3-4, 6-8



NOTE: *1: 2-wires RS-485 function

*2: 4-wires point-to-point full duplex function

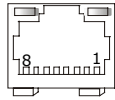


3.12 Ethernet Connector

The 3308350 provides two external RJ-45 interface connectors. Please refer to the following for its pin information.

- **CN11/CN12: RJ-45 Connector**

PIN	Description
1	TX+
2	TX-
3	RX+
4	R/C GND
5	R/C GND
6	RX-
7	R/C GND
8	R/C GND

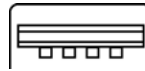


3.13 USB Connector

The 3308350 provides one 8-pin connector, at location J2, for two USB ports, and one external USB2.0 port at CN14.

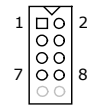
- **CN14: External USB2.0 Connector**

PIN	Description
1	VCC
2	USBD2-
3	USBD2+
4	GND



- **J2: Internal USB2.0 Connector**

PIN	Description	PIN	Description
1	VCC	2	VCC
3	USBD0-	4	USBD1-
5	USBD0+	6	USBD1+
7	GND	8	GND




3.14 CMOS Data Clear

The 3308350 has a Clear CMOS jumper on *JP3*.

- **JP3: Clear CMOS**

Options	Settings
Normal Operation (default)	Open
Clear CMOS	Short



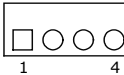
IMPORTANT: Before you turn on the power of your system, please set *JP3* to open for normal operation.

3.15 Power and Fan Connectors

3308350 provides one 4-pin power in at *CN1*. If use ATX function, the *CN1* MUST BE CUT OFF.


- **CN1: 4-pin Power In Connector**

PIN	Description
1	+12V
2	GND
3	GND
4	+12V




- **JP5: AT/ATX Function Select**

Options	Settings
ATX (default)	Open
AT	Short



- **FN1/FN2: Fan Power In Connector**

PIN	Description
1	GND
2	+5V
3	Fan In 1/Fan In 2



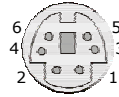
Connector *FN1/FN2* onboard 3308350 is a 3-pin fan power output connector.

3.16 Keyboard/Mouse Connectors

The 3308350 offers two possibilities for keyboard/mouse connections. The connection is via *J4* for an internal 6-pin cable converter to a KB/MS, and *KB1* is PS/2 6-pin mini DIN for KB/MS.

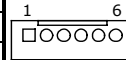
- **KB1: PS/2 6-pin Mini DIN Keyboard/Mouse Connector**

PIN	Description
1	Keyboard Data
2	Mouse Data
3	GND
4	+5V
5	Keyboard Clock
6	Mouse Clock



- **J4: 6-pin Keyboard/Mouse Connector**

PIN	Description
1	Keyboard Data
2	Mouse Data
3	GND
4	+5V
5	Keyboard Clock
6	Mouse Clock



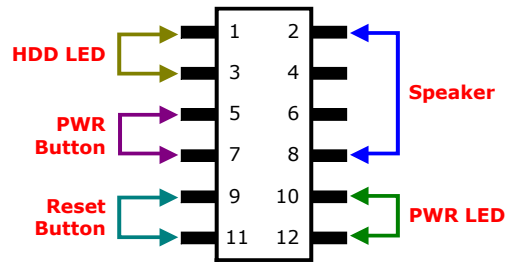
3.17 System Front Panel Control

The 3308350 has front panel control at location *CN8* that indicates the power-on status.

- **CN8: System Front Panel Control**

PIN	Description	PIN	Description
1	VCC	2	Speaker
3	HDD LED	4	N/C
5	PWR Button	6	GND
7	VCC	8	GND
9	Reset Switch	10	VCC
11	GND	12	PWR LED

Connector CN8 Orientation



3.18 Watchdog Timer

Once the Enable cycle is active a Refresh cycle is requested before the time-out period. This restarts counting of the WDT period. When the time counting goes over the period preset of WDT, it will assume that the program operation is abnormal. A system reset signal will restart when such error happens.

The following sample programs show how to enable, disable and refresh the watchdog timer:

```
.286

.MODEL SMALL
.DATA
;this is data area

x1      db  '-----',0ah,0dh,'$'
copyright db '|Copyright by ----- technology write by Richard |',0ah,0dh,'$'
x2      db  '-----',0ah,0dh,'$'

port    equ    02Eh    ;W83627H Chipset port
datao   equ    02Fh    ;data port

.CODE

print   macro   buff
        mov     dx,offset buff;
        mov     ah,09h
        int     21h
        endm

begin   proc    near
        mov     ax,@data
        mov     ds,ax
        STI

        mov     dx,port    ; W83627H
        mov     al,087H    ; Unlock registor
        out     dx,al
        jmp     $+2
        out     dx,al
        mov     dx,port    ;
        mov     al,07H    ;
        out     dx,al
        jmp     $+2
        mov     dx,datao   ; set device 8
        mov     al,08H    ;
        out     dx,al
        jmp     $+2

        mov     dx,port    ; Watchdog IO function
        mov     al,030H    ; registor
        out     dx,al
        jmp     $+2

        mov     dx,datao   ; set 01h toactivate
        mov     al,01H    ;
        out     dx,al
```

```

        jmp     $+2

        mov     dx,port    ; set CRF5
        mov     al,0f5H    ;
        out     dx,al
        jmp     $+2

        mov     dx,datao   ; set CRF5 to secend
        mov     al,00H     ;
        out     dx,al
        jmp     $+2

        mov     dx,port    ; set CRF6 time
        mov     al,0f6H    ;
        out     dx,al
        jmp     $+2

        mov     dx,datao   ; set CRF6 time to 5 s'
        mov     al,05H     ;
        out     dx,al

        print   x1
        print   copyright
        print   x2
        mov     ah,4ch     ;go back to dos
        int     21h
        .stack
begin   endp
end     begin

```

User can also use AL, 00H's defined time for reset purposes, e.g.00H for Disable, 01H = 1sec, 02H=2sec....FFH=255sec.

3.19 Audio Connectors

The 3308350 has an onboard AC97 3D audio controller. The following tables list the pin assignments of the Line In/Audio Out connector.

- **CN15: MIC In/Line Out Connector**

PIN	Description	PIN	Description
1	AOUTL	2	AOUTR
3	GND	4	GND
5	MIC IN	6	N/C
7	GND	8	GND



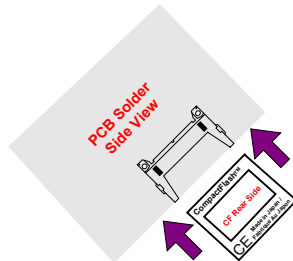
3.20 CompactFlash™ Connector

The 3308350 also offers a Type I/II CompactFlash™ connector which is IDE interface located at the solder side of the board. The designated CN19 connector, once soldered with an adapter, can hold CompactFlash™ cards of various sizes. Please turn off the power before inserting the CF card.

- **CN19: CompactFlash™ Connector**

PIN	Description	PIN	Description
1	GND	2	IDE_PDD3
3	IDE_PDD4	4	IDE_PDD5
5	IDE_PDD6	6	IDE_PDD7
7	IDE_PDCS1#	8	GND
9	GND	10	GND
11	GND	12	GND
13	+3.3V	14	GND
15	GND	16	GND
17	GND	18	IDE_PDA2
19	IDE_PDA1	20	IDE_PDA0
21	IDE_PDD0	22	IDE_PDD1
23	IDE_PDD2	24	GND
25	GND	26	GND
27	IDE_PDD11	28	IDE_PDD12
29	IDE_PDD13	30	IDE_PDD14
31	IDE_PDD15	32	IDE_PDCS3#
33	GND	34	IDE_PDIOR#
35	IDE_PDIOW#	36	+3.3V
37	INT_IRQ15	38	+3.3V
39	+3.3V	40	N/C
41	RESET#	42	IDE_PDIORDY
43	CF_PDERQ	44	CF_REGB
45	IDE_ACTP#	46	DETECT
47	IDE_PDD8	48	IDE_PDD9
49	IDE_PDD10	50	GND

Inserting a CompactFlash™ card into the adapter is not a difficult task. The socket and card are both keyed and there is only one direction for the card to be completely inserted. Refer to the diagram on the following page for the traditional way of inserting the card.



- **JP4: CF Use Master/Slave Select**

Options	Setting
Master	Short
Slave (default)	Open



NOTE: When use CF card, IDE device function will be disabled.

3.21 Expansion Slot

The 3308350 offers one mini PCI-E expansion slot at CN20.

3.22 8-bit I/O Function

The 3308350 offers one 8-bit input/output port by parallel port.

- **JP6: 8-bit Input/Output**

PIN	Description	PIN	Description
1	VCC	2	GND
3	GD0	4	GD4
5	GD1	6	GD5
7	GD2	8	GD6
9	GD3	10	GD7



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```

.MODEL SMALL
.DATA
port equ 0378h ;this is data area
;print port can be change to 278h

.CODE

print macro buff
mov dx, offset buff;
mov ah,09h
int 21h
endm

delay :

```

```

        push    cx
        mov     cx,0155h
@@:     jmp     $+2
        push    cx
        mov     cx,0ffffh

wait1:  loop    wait1
        pop     cx
        loop   @b
        pop     cx
        ret

begin   proc    near
        mov     ax,@data
        mov     ds,ax

        Mov     dx, port
        Mov     al, 80h          out     dx, al
;;-----
;;ROR
        mov     cx, 08h
@@:     ror     al, 1
        call   delay
        out    dx, al
        loop   @b
        pop    cx
;;ROL
        push   cx
        mov   cx, 08h
@@:     rol    al, 1
        out   dx, al
        call  delay
        loop  @b
        pop   cx
;;-----
;;ROR
        mov     cx, 08h
@@:     ror     al, 1
        call   delay
        out    dx, al
        loop   @b
        pop    cx
;;ROL
        push   cx
        mov   cx, 08h
@@:     rol    al, 1
        out   dx, al
        call  delay
        loop  @b
        pop   cx

```

```

;;-----
;;-----
;;ROR
    mov     cx, 08h
@@:
    ror     al, 1
    call   delay
    out     dx, al
    loop   @b
    pop     cx
;;ROL
    push    cx
    mov     cx, 08h
@@:
    rol     al, 1
    out     dx, al
    call   delay
    loop   @b
    pop     cx
;;-----
;;-----
;;ROR
    mov     cx, 08h
@@:
    ror     al, 1
    call   delay
    out     dx, al
    loop   @b
    pop     cx
;;ROL
    push    cx
    mov     cx, 08h
@@:
    rol     al, 1
    out     dx, al
    call   delay
    loop   @b
    pop     cx
;;-----
;;-----
;;ROR
    mov     cx, 08h
@@:
    ror     al, 1
    call   delay
    out     dx, al
    loop   @b
    pop     cx
;;ROL
    push    cx
    mov     cx, 08h
@@:
    rol     al, 1
    out     dx, al
    call   delay
    loop   @b
    pop     cx
;;-----

```



```

;;-----
;;ROR
mov    cx, 08h
@@:   ror    al, 1
      call delay
      out   dx, al
      loop @b
      pop   cx
;;ROL
push   cx
mov    cx, 08h
@@:   rol    al, 1
      out   dx, al
      call delay
      loop @b
      pop   cx
;;-----
;;-----
;;ROR
mov    cx, 08h
@@:   ror    al, 1
      call delay
      out   dx, al
      loop @b
      pop   cx
;;ROL
push   cx
mov    cx, 08h
@@:   rol    al, 1
      out   dx, al
      call delay
      loop @b
      pop   cx
;;-----
;flash LED 3 time
mov    cx, 01h
@@:   mov    al, 0ffh
      out   dx, al
      call delay
      mov    al, 0h
      out   dx, al
      call delay
      loop @b
ee:
      mov    ah, 4ch
      int   21h
      .stack
      begin endp
      end begin
;go back to dos

```

Any advice or comments about our products and service, or anything we can help you with please don't hesitate to contact with us. We will do our best to support your products, projects and business.



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